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(54) Abstract Title
A short reach communication network

(57) In a building, a mobile communications network 15 operates a plurality of short reach RF base stations 20-n, preferably Bluetooth, to establish communication with authorised terminals 22, 26, located in an area of interest serviced by the base stations 20-n. The network 15 connects authorized terminals, located within the area, to each other. The base stations 20-n are provided within the building and use the in-building wiring infrastructure, such a telephone lines or a LAN 25, to connect to a central data processing centre 30 having a mobility manager 34. The processing centre 30 monitors the location of authorised terminals within the building, determining whether or not they are mobile and validating their identity and associated access rights, for establishing voice, data and video communications. The processing centre 30 can also re-direct fixed line incoming communications to the appropriate mobile terminal 22, 26, as instructed, e.g. a mobile user within the building is paged about an incoming call, for example, via organiser 26 and an appropriate response is made, e.g. call sent to voicemail or to the nearest desk telephone 23. The network also enables authorized terminals to communicate with an outside communication network, e.g. a WAN, PSTN, LAN. A further invention concerning the handover of in-progress calls in a short reach network, drops calls that have been put on hold during handover if a predetermined time period has expired.

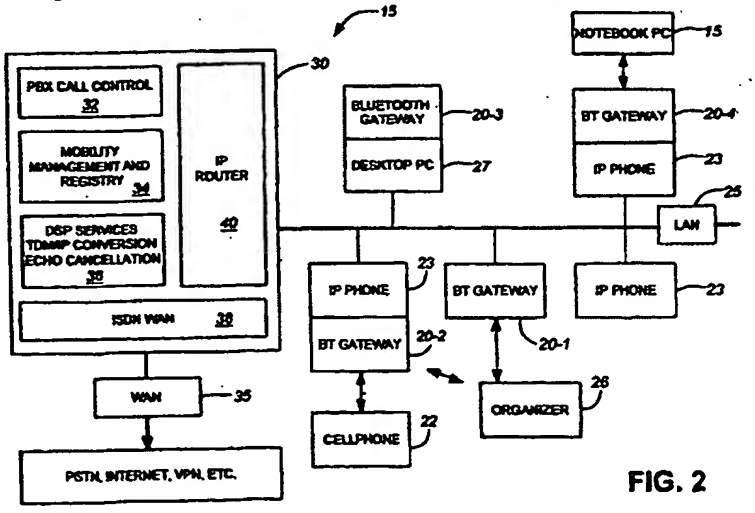

FIG. 2

At least one drawing originally filed was informal and the print reproduced here is taken from a later filed formal copy.

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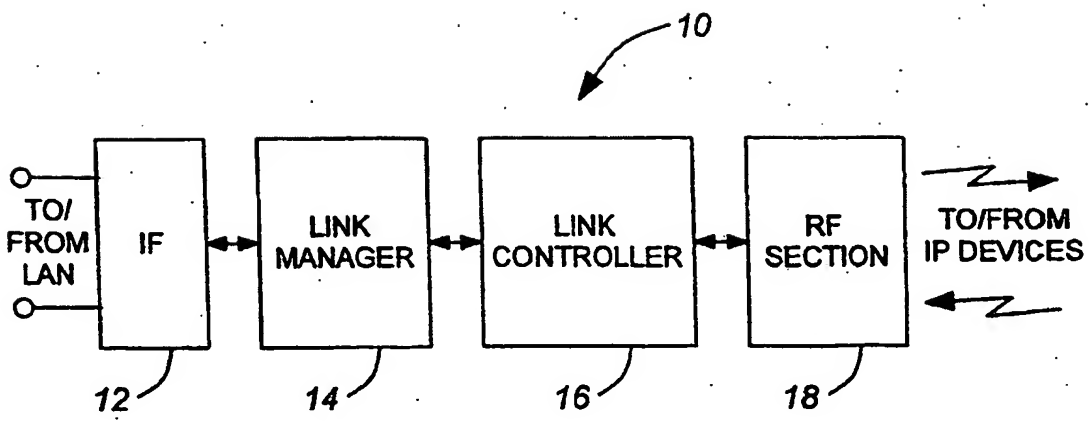

PRIOR ART

FIG. 1

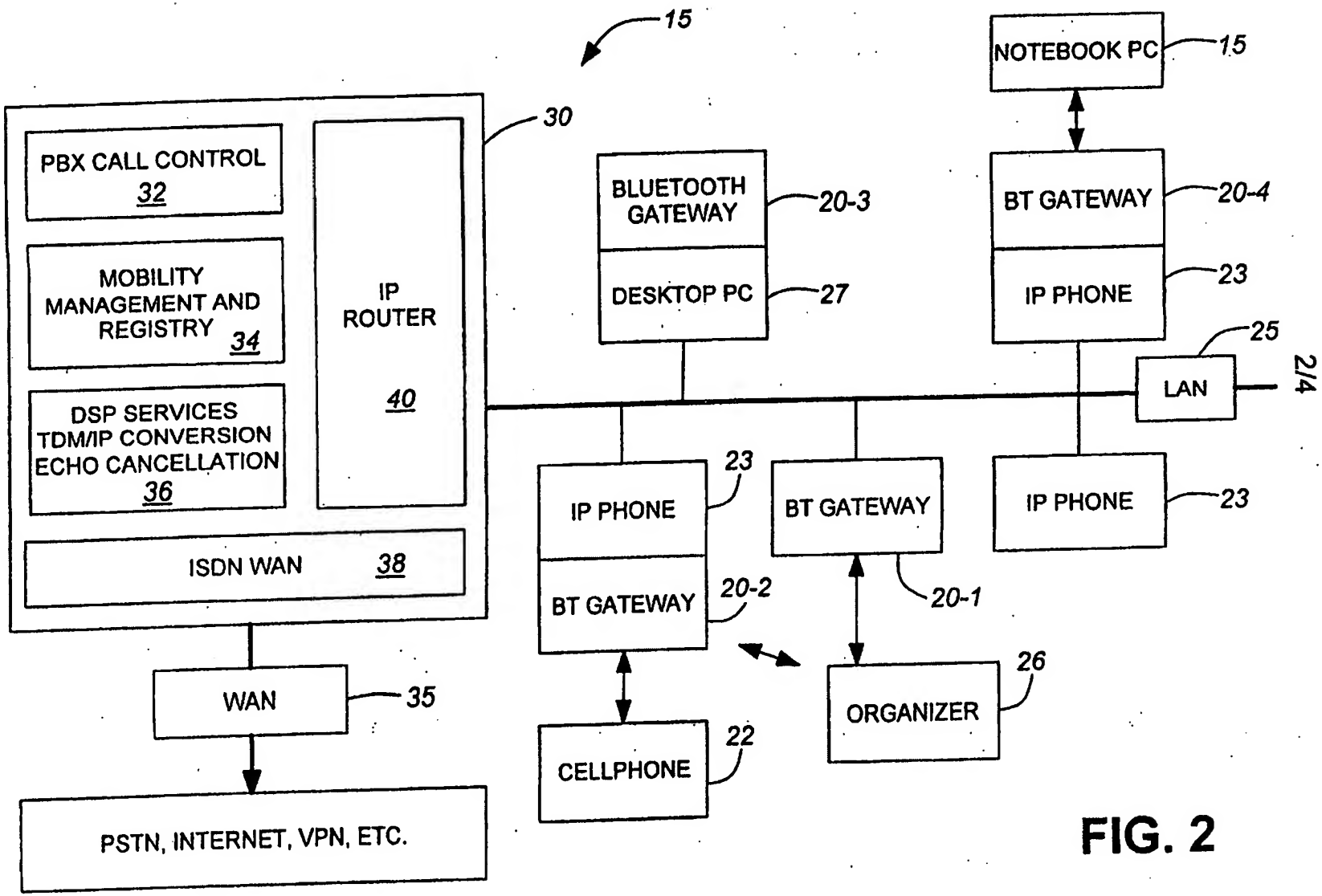
15
NOTEBOOK PC
15
30
PBX CALL CONTROL
32
MOBILITY MANAGEMENT AND REGISTRY
34
DSP SERVICES TDM/IP CONVERSION ECHO CANCELLATION
36
IP ROUTER
40
ISDN WAN
38
BLUETOOTH GATEWAY
20-3
DESKTOP PC
27
BT GATEWAY
20-4
IP PHONE
23
25
LAN
2/4
IP PHONE
23
BT GATEWAY
IP PHONE
23
BT GATEWAY
20-2
20-1
WAN
35
ORGANIZER
26
CELLPHONE
22
PSTN, INTERNET, VPN, ETC.

FIG. 2

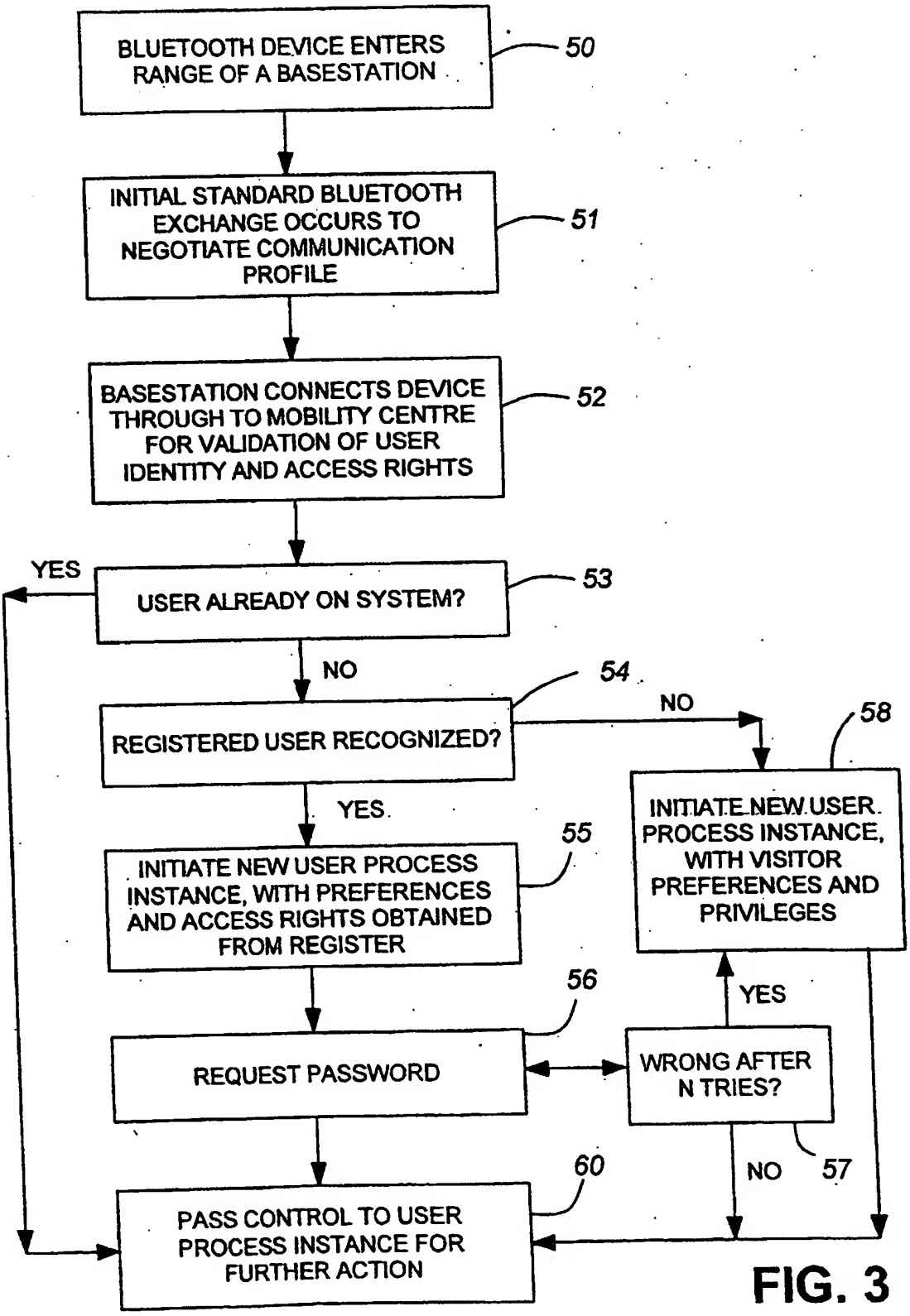
BLUETOOTH DEVICE ENTERS RANGE OF A BASESTATION
50
INITIAL STANDARD BLUETOOTH EXCHANGE OCCURS TO NEGOTIATE COMMUNICATION PROFILE
51
BASESTATION CONNECTS DEVICE THROUGH TO MOBILITY CENTRE FOR VALIDATION OF USER IDENTITY AND ACCESS RIGHTS
52
YES
USER ALREADY ON SYSTEM?
53
NO
54
NO
REGISTERED USER RECOGNIZED?
58
INITIATE NEW USER PROCESS INSTANCE, WITH VISITOR PREFERENCES AND PRIVILEGES
YES
55
INITIATE NEW USER PROCESS INSTANCE, WITH PREFERENCES AND ACCESS RIGHTS OBTAINED FROM REGISTER
56
YES
REQUEST PASSWORD
WRONG AFTER N TRIES?
NO
57
60
PASS CONTROL TO USER PROCESS INSTANCE FOR FURTHER ACTION

FIG. 3

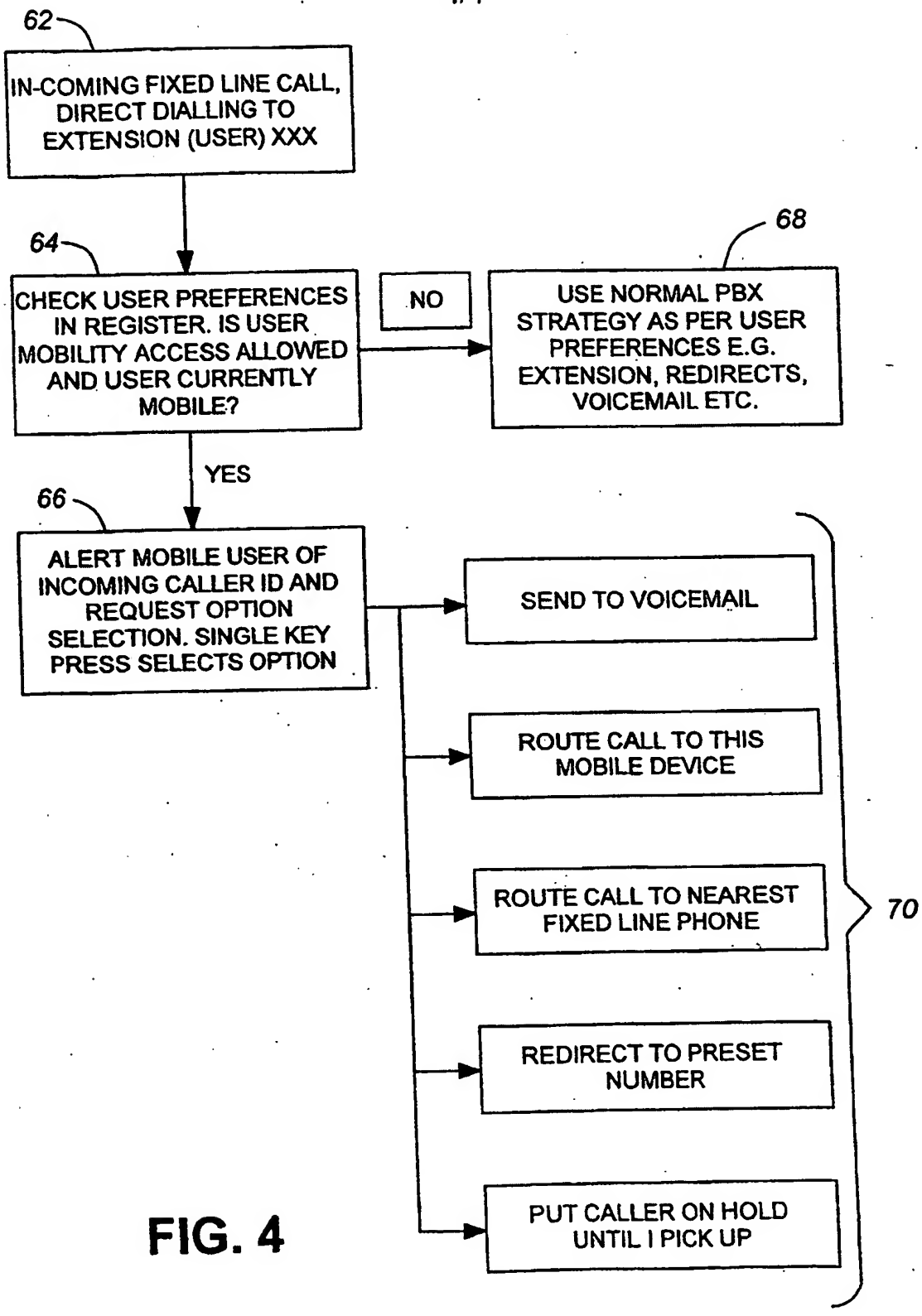
62
IN-COMING FIXED LINE CALL, DIRECT DIALLING TO EXTENSION (USER) XXX
64
CHECK USER PREFERENCES IN REGISTER. IS USER MOBILITY ACCESS ALLOWED AND USER CURRENTLY MOBILE?
NO
68
USE NORMAL PBX STRATEGY AS PER USER PREFERENCES E.G. EXTENSION, REDIRECTS, VOICEMAIL ETC.
YES
66
ALERT MOBILE USER OF INCOMING CALLER ID AND REQUEST OPTION SELECTION. SINGLE KEY PRESS SELECTS OPTION
SEND TO VOICEMAIL
ROUTE CALL TO THIS MOBILE DEVICE
ROUTE CALL TO NEAREST FIXED LINE PHONE
REDIRECT TO PRESET NUMBER
PUT CALLER ON HOLD UNTIL I PICK UP
70

FIG. 4

In-building Mobile Communications Network

Field of the Invention

This invention relates generally to the field of wireless communications and in particular to a short range wireless communication network for providing voice, data and video communication to wireless terminals located in a relatively small area.

Background of the Invention

The massive expansion of wireless technology indicates a growing demand of the wireless communication system users for similar services available to users of fixed communication systems. Voice, video and data applications are currently available over fixed communication systems, such as telephones, computer, etc. There is a growing demand to provide wireless users with these services using a personal wireless terminal that could be used anywhere. It is of importance for example to have access to these services within an office building.

Although cellular and cordless technologies, such as GSM (global system mobile) and DECT (digital enhanced cordless telephone) provide a reasonable transport mechanism for the current mobility requirements, they do not provide a cost effective, reliable solution for mobility within buildings. This is mostly due to shortcomings like coverage planning, capacity planning, spectrum ownership, incompatibility of RF interfaces, or inadequate data protocols.

In-building communication systems require skilled manpower and detailed building surveys in order to provide coverage for all areas (including e.g. elevators), while keeping the costs for planning, installing and maintaining the network to a minimum. The distribution of radio frequency (RF) signals is particularly difficult in areas with many obstacles which scatter or absorb radiation, e.g. inside and around the building structures. Even with a careful area of coverage planning, there can be black-spots.

Current in-building distribution networks include a set of in-building antennas and associated equipment for re-transmitting the signals within the building and the cabling system used for interconnecting the in-building antennas with a main antenna, to ensure coverage of the serviced area for connection with an outside of the building wireless/wireline network. The cost for installing and maintaining such in-building distribution networks is very high. Therefore, the chances for a wide adoption of this type of distribution networks are rather slim.

The number of voice/data connections that can be handled in a wireless network is dependent on the available RF spectrum. As voice, data and video services become more widespread, and the number of users and service requests grow, the demand for bandwidth in the access network grows accordingly. Access bandwidth is valuable especially in the wireless environment, where the growth in voice/data connections leads to frequency re-use, which in turn requires reducing the area a base station covers. This becomes an acute problem within office buildings with numerous users.

In addition, current cellular technology, such as GSM, is expensive and bulky for in-building use, as this technology has been designed for wide area transmission conditions, and for fast mobility. As well, current wireless technologies provide relatively low data rates compared to fixed line standards.

Furthermore, the spectrum available in the current wireless technologies is very limited, is owned by the network operators who expect a return on their investment. Users of wireless in-building networks on the other hand expect local calls to be free, as for landline users. In addition, wireless users expect to obtain similar services as land-line users anywhere in the world. GSM is the nearest to a world standard, but it is not likely to be incorporated into all wireless devices; there are still numerous different interfaces especially in the USA and Japan. The same is true of cordless phone technology, e.g. DECT for voice transmissions, which is not a world-wide standard and not likely to become one. Similarly, the Wireless

LAN/Home RF technology uses variable standards, with niche applicability, and is not likely to be incorporated into all wireless devices.

Accordingly, there is a need for a low cost, integrated local mobility network for simultaneous voice and data communications and interaction between electronic devices within buildings, allowing them to communicate with the external world.

Summary of the Invention

It is an object of the present invention to alleviate totally or in part the disadvantages of the prior art associated with in-building communications.

It is another object of the invention to provide a short range wireless communication network for providing voice, data and video communication to wireless and/or wireline terminals located within a relatively small area, such as a building. Short range RF gateways, or base stations, are provided within the building structure, and arranged in such a way so as to cover all areas where an authorized terminal may travel, and also to allow connection with fixed/mobile terminals.

The network of the present invention may use, for example, short range RF Bluetooth (BT) base stations placed to provide a ubiquitous wireless communications network. In this case, the terminals subscribing to the network will also be Bluetooth enabled (BT-enabled) terminals. Bluetooth (BT) is a global RF communications standard that has been developed primarily to allow data exchange between electronic devices placed in close proximity to each other.

The base stations are connected to each other through a processing center and the local area network (LAN). The processing center controls the operation of the base stations, monitors the location of the BT-enabled terminals within the building, determines whether the terminal is mobile or not, and coordinates the voice/data communications. The processing center can also route external incoming and outgoing traffic to/from the appropriate communications device. The processing center may be incorporated into a

PBX (private branch exchange), or in the router equipment, whichever is available in the respective environment.

According to one aspect of the invention, a short reach communication network is provided. The network comprises a LAN for providing a transport mechanism for voice, video and data signals; a plurality of short range RF base stations connected to the LAN, each base station for providing a short range coverage area; and a mobility center for operating the base stations to establish communication between authorized terminals located within an area of interest. The base stations are placed at predetermined locations in the area of interest for servicing the entire area of interest. The mobility center also enables subscribing terminals within the area of interest to communicate with an outside communication network, e.g. a WAN, PSTN, LAN, VPN.

The invention provides a user-friendly integrated short range wireless communications network. When the subscribers are mainly mobile inside the building and communicate via cellular phones, pagers, or other portable electronic device, the wireless terminals may be provided with handover capabilities. Bluetooth has not been specified to allow a mobile user to pass seamlessly from one coverage area to the next. The standard may however be expanded to cover handover, or the network may be provided with a very simple handover protocol.

The present invention also provides for low network costs due to the consumer technology involved, as well as low communications costs due to use of fixed wires for distant transport. No cable installation or cable replacement is required as the existing cables can be reused, e.g. the telephone wiring, or the LAN which is already present in most office buildings.

Another advantage of the invention is that it allows use of multiple and simultaneous voice and data connections, by offering a relatively high bandwidth to numerous users under the supervision of the processing center. Since the base stations and the subscribing terminals are provided with compatible short range interfaces, once the processing center is incorporated

into the private branch exchange (PBX) or into the router equipment, a universal communication protocol is created for the network inside the building.

The "Summary of the Invention" does not necessarily disclose all the features essential for defining the invention; the invention may reside in a sub-combination of the disclosed features.

Brief Description of the Drawings

The invention will be now explained by way of example only and with reference to the following drawings:

Figure 1 is a block diagram of a conventional Bluetooth base station;

Figure 2 is an overview diagram of the in-building mobile communication network according to the invention;

Figure 3 is a flow chart illustrating how the network of Figure 2 authorizes access and registers a communication terminal; and

Figure 4 is a flow chart illustrating how the network of Figure 2 re-directs a fixed line incoming call to a mobile terminal inside the building.

Similar references are used in different figures to denote similar components.

Detailed Description of the Preferred Embodiment

The following description of a preferred embodiment is provided by way of example only and without limitation to the combination of features necessary for carrying the invention into effect.

Figure 1 illustrates a block diagram of base station for a short range wireless network using Bluetooth standard, as shown on Ericsson's web page at http://bluetooth.ericsson.se/default.asp. Base station **10** uses an unlicensed RF spectrum band at 2.4 GHz.

A host interface **12** sets-up the connections between the base station **10** and e.g. a LAN, and converts the incoming and outgoing signals to/from signals according to the local protocols. A link manager **14** is responsible for

setting up high level logical links, detecting BT-enabled devices within the coverage area of the base station, and reporting loss of existing connections. It communicates with the mobility centre to determine what actions to take.

A link controller **16** performs low level processing on the bits, to ensure reliability and timing, and picks out the logical data bit streams associated with each channel of information embedded together in the physical stream, and vice versa

As the wireless subscribers come into the operating range of the base station, they link to a RF section **18** using a modulated high frequency signal, for example a 2.4 GHz signal. Such subscribers could be mobile phones, personal computers (PC), laptops, or other electronic devices, e.g. medical devices, equipped with a built-in short range module. The radio section **18** demodulates the information from the 2.4GHz wide-band signal into a base-band 1Mbit rate bit-stream, and vice versa.

The operating range, or the coverage area of BT **10** is approximately 10 meters when no amplifier is used, and up to 100 meters with an amplifier. As mentioned before, connections are automatically setup and maintained even when the subscribing terminals are not within the line of sight with the base station; therefore the system allows the terminals to "talk" to each other on an ad hoc basis.

Figure 2 shows a block diagram of the in-building short range communication network **15**, according to a preferred embodiment of the invention. The network **15** comprises a plurality of gateways, or base stations **20-1** to **20-4**, connected over a LAN **25**. Sub-networks, or pico-networks (piconets) are established within the area of interest, and linked ad-hoc when the base-stations **20** are integrated into LAN **25**. In the case when the network **15** is based on the Bluetooth standard, the gateways are BT gateways, and the subscriber terminals are BT-enabled terminals. Of course, other protocols may be used as they emerge, but presently the Bluetooth technology is able to provide these interfaces at acceptable prices.

A 'subscribing terminal', a 'registered terminal' or a 'registered user' refers in this document to a telephone, a pager, a personal computer, a laptop, a cellular phone, a notebook, an organizer, a medical device, and other similar electronic devices, adapted to be connected to a short range RF base station. Each base station has an operating range, or a coverage area. One or more base stations may form a piconet. The term 'close range' or 'short range' refers herein to the ability of the base station to communicate with a wireless terminal located within a piconet.

The Bluetooth (BT) specification lays down how BT-enabled devices communicate, and establish protocols between themselves to use the short range RF link to pass voice, video and data. A Bluetooth "user's profile" defines how a device wishes to communicate, e.g. data rates, whether synchronous or asynchronous, etc. Several devices can coexist within such piconets under the supervision of one device being the master base station that coordinates communications and controls the RF resource. In the preferred embodiment each system base station uses these protocols to establish itself as a master station in its own piconet.

Base station **20** may be embedded in an electronic device for providing RF communications (receiving and transmitting) at one end, while the other end is connected to a mobility center **34** via LAN **35**. Examples of physical presentations of base station **20** are illustrated in Figure 2 and described below.

A dedicated standalone RF only module BT-gateway **20-1** may be plugged into the LAN **25** or a telephone socket. Gateway **20-1** has its own coverage area and is capable of detecting a mobile terminal, subscribing or visiting, entering into its area of coverage. If for example the user of the organizer **26** approaches the gateway **20-1**, an alerting message may be transmitted to the organizer **26** to inform the user of an urgent action.

Gateway **20-2** is a module build into, or added to a desk telephone **23**. The telephone **23** is connected to other devices through the LAN **25**, as well

known, and also will operate as an IP telephone. Gateway **20-3** is built into a desktop PC **27**.

If the gateway **20-2** detects a laptop/notebook **28** in its coverage area, it automatically connects laptop **28** to the LAN **25**, if the laptop is adapted to communicate over the short range network **15**. Similarly, the gateway **20-4** which is a module build into, or added to a desk telephone **23** , establishes its own coverage area and is also connected to the LAN **25**. All gateways are also adapted to communicate with for example a cellular telephone **22** that enters the coverage area, if the telephone **22** is adapted to communicate over the short range network **15**.

It is to be understood that any device like desktop charger, or holder, optionally powered from the LAN wiring and having a built-in BT module, as well as any BT/RF enabled device which can communicate on the LAN **35**, or the in-building wiring, may be considered as a base station.

The piconets that are connected over LAN **25** are controlled in the processing centre **30** by a dedicated mobility management unit, or mobility centre **34**, working alongside a conventional PBX call control **32**, and a data router **40**. A registry database (not shown) contains the identity of all terminals registered to the in-building network **15**, and also any associated attributes, such as for example communications access rights to the WAN **35**, data access rights to the devices on the LAN **25**, communications preferences associated with each user, physical access rights to building areas, and other user access rights. In this way, all authorized terminals communicating with network **15** are registered in the registry database (not shown) and are uniquely recognizable, allowing the network operator to restrict or to extend user access rights, as appropriate.

The PBX call control **32** and the IP router **40** all operate in a conventional manner, as is well known in the art, but interact with the mobility management unit **34** to allow routing to/from the mobile devices. In the simplest first physical embodiment the PBX call control **32**, the IP router **34** and the mobility management unit **36** are software objects within a single

processor 30. The processor 30 communicates inside the building over a conventional Ethernet LAN 25 using the transmission control protocol (TCP) or the Internet protocol (IP) as is well known in the art, and externally to the WAN 35 also using TCP/IP for voice and data. An integrated services digital network (ISDN) block 38 is used in the example of Figure 2 for transmissions over WAN 35.

Mobility centre 34 identifies the terminals authorized to communicate with the network 15, by performing authentication of registered subscribers wishing to initiate communications and choosing the appropriate communications protocol. Mobility centre 34 also detects visiting BT-enabled devices within the coverage area of a base station 20, and initiates new user process instance to determine visitor's access rights like communications access rights, data access rights, physical access to specific areas in the building, communications preferences, password allocation, and to authorize visiting terminals to access the network 15. Finally, the mobility centre 34 controls the registration of the visitor's data (ID, access rights, password) in the database .

In a more complex embodiment of the invention, other interfaces are available in block 36 to allow interworking with the more conventional time division multiplexing (TDM) based peripherals and WAN connections, and other forms of WAN connections such as digital subscriber link (DSL) technology. Processor 30 allows for conversion from the asynchronous packet based TCP/IP data flow, to the fixed data length synchronized TDM connection, perhaps utilizing an associated digital signal processor (DSP) for this purpose.

Figure 3 is a flow chart illustrating how the network of Figure 2 authorizes access and registers a communication terminal. Mobile terminals entering within the range of a master base station, or gateway 20 are detected at step 50. Initially, an exchange of messages occurs (using for example the existence of Bluetooth protocol) to negotiate a communication profile, step 51, where the terminals announce their identity as specified.

Next, the master base station **20** specifically informs the network **15** that the communication with the newly identified terminal is ready to proceed. This communication could be done using a standard protocol such as H323, or other proprietary protocols, as appropriate.

The base station **20** communicates back to the mobility management unit **34** and connects the device to the mobility management unit **34**, validates the user's identity and accesses the registry to determine the access rights, at step **52**. The mobility centre **34** then determines in step **54** if the terminal is a mobile subscribing terminal already connected to network **15**. If yes, the process moves to step **60**, and the terminal regains full control for further action.

If no, the mobility center determines in step **54**, whether the user is registered with the network **15**, by checking the user's identification in the registry database **35**. For a registered user willing to re-access the network **15**, a new user process instance is initiated at step **55** with user's access rights and attributes obtained from the registry.

For a visiting user not previously registered with the network **15**, a new user process instance is initiated at step **58** with visitor's access rights determined through a dialogue between the visitor and the mobility centre **34**. Finally, the visitor's presence and location in the network **15** are stored in the registry.

A password is requested at step **56** and if valid, the subscribing user is registered as an active user and the control is passed to the terminal for further action, at step **60**. If after a preset number of attempts the user's password is not recognized by the system, step **57**, the process continues with step **58** for initiating the visitor procedures.

A network operator, a user of a master base station, or any user, can change the user's device access rights using any local or remote terminal, provided that security has been achieved by a password, or equivalent procedure.

Figure 4 is a flow chart illustrating how the network of Figure 2 re-directs a fixed line incoming call to a mobile user inside the building. The incoming call may come through a direct dialling to the user's extension, step 62. The mobility centre 34 identifies the user and verifies the user's access rights, access rights, and also determines if the user is mobile or not at step 64.

If the user is not mobile, normal PBX strategy is used as per user's preferences, at step 68. These preferences may be to re-direct the call, use the extension phone, voicemail, or others.

If the user is mobile, the system alerts the user of an incoming caller ID and requires option selection, at step 66. With a single key press the mobile user can select from the listed options, step 70. In Figure 4 the options are identified as "send to voicemail", "route call to this mobile device", "route call to nearest fixed line phone", "re-direct to preset number", "put caller on hold until I pick up". It is however understood that any similar options available in the network 15 may be considered.

In operation, whenever a user having a cellular phone 22 is within range of a base station, the respective base station logs the terminal presence, and the mobility management unit 34 communicates with the PBX call control 32, setting up a connection with this particular base station. The incoming calls, either internal or external, arrive to the user cellular phone 22 via the base stations 20, such as gateway 20-4 in Figure 2. In the same way the cellular phone 22 is programmed to direct outgoing calls via the short range link, rather than via the wide area network infrastructure. In this way, several calls can be handled by one base station.

In a similar way the user of laptop 28 will be detected by the mobility management unit 34 through the gateway 20-2, and will be connected automatically to the LAN, if recognized by network 15. All WAN connectivity, i.e. Internet, will be available, subject to user access rights.

User preferences may work in a similar way. For example, the user of electronic organizer 26 has specified that he wishes to be paged if an

in-coming call arrives. The mobility management unit **34** communicates with the PBX call control **32**, telling it to notify of any in-coming calls for the user, and to put them on hold until instructed further. After receiving a fixed line incoming call the mobility management unit **34** sends an alerting message to the organizer **26** and awaits a user response. The response may indicate to select a redirect to voice mail, or may include instructions to forward the call to the nearest desk phone.

In the case of a real time communication, e.g. voice call, both ends (the communicator and the user) would be notified of the hold status by e.g. an audio message. When in-building, the main focus is the wireless desktop rather than true mobility, so handovers are relatively infrequent as users stay in fixed positions when making calls or using their PC, but like to be able to change positions easily.

The standard may well be extended to cover a seamless handover for a mobile user moving inside the building from one coverage area to another. by putting the communications on hold until the link is re-established on the same or a different base station within a suitable timeout period. If the period is exceeded, the call is dropped.

For example, if a user moves out of range of a base station **20** whilst communicating the link is put on hold by both the mobility center **34** and the communicator, a suitable message being generated to both parties. A timer is set and if the link is re-established before timeout, either on the same or another base station, the communication continues. On timeout the communication is assumed to have ended and the system cleared down.

An in-building mobile communications network using short range RF base stations **20** integrated in the building infrastructure to provide an efficient mobile communications network **15** for consumer electronic devices within a serviced area, was presented. Base stations **20** use the in-building wire-line infrastructure, such as telephone lines or the LAN **25** to connect to a central data processing centre **30**. The processing centre **30** monitors the location of the mobile terminals within the building, determines whether they are mobile

or not, validates their identity and associated access rights, for establishing voice, data, and video communication. The processing centre **30** and can also re-direct fixed line incoming communications to the appropriate mobile terminal. The invention also enables authorized terminals to communicate with an outside communication network, e.g. a WAN, PSTN, LAN, VPN, with high reliability, due mainly to use of short range RF communications.

The mobile communications network **15** of the invention is extremely low cost, while the protocols are flexible allowing multiple simultaneous voice and data communications.

Numerous modifications, variations, and adaptations may be made to the particular embodiments of the invention without departing from the scope of the invention which is defined in the claims.

Claims:

1. A short reach communication network comprising:

a LAN for providing a transport mechanism for voice, video and data signals;

a plurality of short range radio frequency (RF) base stations connected to said LAN, each for providing a short range coverage area; and

a mobility center for operating said base stations to establish communication between authorized terminals located within an area of interest;

wherein said base stations are so disposed in said area of interest for substantially serving the entire said area of interest.

2. A network as claimed in claim 1, further comprising means for establishing connection between said LAN and a WAN serving an area different from said area of interest.

3. A network as claimed in claim 1, further comprising means for establishing connection between said LAN and a PSTN serving an area different from said area of interest.

4. A network as claimed in claim 1, further comprising means for establishing connection between said LAN and a cell phone network serving an area different from said area of interest.

5. A network as claimed in claim 1, wherein said area of interest is a building.

6. A network as claimed in claim 1, wherein said base stations are powered from said LAN.

7. A network as claimed in claim 1, wherein said mobility center comprises a database for recording a unique identification (ID) and associated user access rights of said authorized terminals.

8. A network as claimed in claim 7, wherein said mobility centre for determining the identification ID) of a terminal entering said area of interest and willing to communicate, and determining whether said terminal is mobile or not.

9. A network as claimed in claim 8, wherein said mobility centre for validating said ID and said access rights, and authorizing a subscribing terminal to access said network.

10. A network as claimed in claim 8, for processing said ID and access rights associated with a terminal visiting said area of interest and willing to communicate, and authorizing said visiting terminal to access said network.

11. A network as claimed in claim 1, wherein each said base station is integrated into a desk telephone.

12. A network as claimed in claim 11, wherein said base station further connects a mobile terminal detected within said coverage area to said LAN, on request.

13. A network as claimed in claim 1, wherein said base station is integrated into a personal computer connected to said LAN.

14. A network as claimed in claim 13, wherein said base station further connects a mobile terminal detected within said coverage area of said LAN, on request.

15. A network as claimed in claim 1, wherein said base station is a dedicated standalone unit, for connecting a mobile terminal detected within said coverage area of said LAN, on request.

16. A network as claimed in claim 1, wherein said base station is a integrated into a desktop charger for connecting a mobile terminal detected within said coverage area to said LAN, on request.

17. A network as claimed in anyone of claims 12, 14, 15 or 16, wherein said mobile terminal is a cellular phone.

18. A network as claimed in claim 1, wherein said coverage area has a radius up to100m from said base station.

19. A network as claimed in claim 1, for enabling remote synchronization between mobile and fixed terminals.

20. A network as claimed in claim 1, having handover capabilities implemented through a hold status on the communication link.

21. A network as claimed in claim 1, wherein each said base station operating in a piconet within said area of interest is programmed to request master base station status for coordinating communications and controlling RF resource in said piconet.

22. A method for establishing a short reach communication network within an area of interest, comprising:

placing a plurality of short range RF base stations in said area of interest, each base station providing a coverage area for substantially serving the entire said area of interest;

connecting said base stations over a LAN; and

operating said base stations to establish communication between authorized terminals within said area of interest.

23. A method as claimed in claim 22, further comprising connecting said LAN to a WAN serving an area different from said area of interest.

24. A method as claimed in claim 22, further comprising establishing connection between said LAN and a PSTN serving an area different from said area of interest.

25. A method as claimed in claim 22, further comprising establishing connection between said LAN and a cell phone network serving an area different from said area of interest.

26. A method as claimed in claim 22, further comprising recording in a registry database a unique identification (ID) and associated user access rights of said authorized terminals.

27. A method as claimed in claim 22, further comprising programming each said base stations operating in a piconet of said area of interest to request master base station status for coordinating communications and controlling RF resource in said piconet.

28. A method for authorizing a communication terminal to access a short reach communication network, said network including a mobility centre and a plurality of short range RF base stations, said terminal for RF communication with said network when entering a coverage area serviced by a base station, said method comprising the steps of:

detecting said terminal by said base station;

establishing connection between said mobility centre and said base station;

determining the identity (ID) of said terminal, and:

a) if said terminal is already connected to said network, record the change of location;

b) if said terminal is a subscribing terminal willing to communicate, obtaining said user access rights from said database, and authorizing communication; and

c) if said terminal is a visiting terminal willing to communicate, initiating new user process instance for determining visitor's user rights, validating said visitor's user rights, authorizing access to said network, and recording visitor's data.

29. A method as claimed in claim 28, wherein said step of validating comprising using a password.

30. A method for directing a fixed line call to an authorized terminal present within an area of interest of a communication network, said network including a mobility centre and a plurality of short range RF base stations, said method comprising the steps of:

receiving a fixed line incoming call;

detecting said terminal by a base station;

establishing connection between said mobility centre and said base station;

determining whether said terminal is mobile or not; and

selecting a preferred mode for directing sais call if said terminal is mobile.

31 A method to handover of a communication call already in progress in a short reach communication network, comprising the steps of:

putting said call on hold and notify both the communicator and the user;

set a timer and wait for a period of time;

compare the elapsed time with a predetermined timeout period and re-establish connection whenever said elapsed time does not exceed said timeout period, and drop connection whenever said elapsed period is greater than said timeout period.

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Application No: GB 0002050.3 **Examiner:** Anita Keogh
Claims searched: 1-27 **Date of search:** 14 December 2001

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Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed.S): H4L (LDGR, LDGX, LRAB, LRAD, LRCMA, LRCMR, LRCMX, LRPCC, LRPMX, LRPTA, LRPTK)

Int Cl (Ed.7): H04L, H04M, H04Q

Other: Online: WPI, JAPIO, EPODOC

Documents considered to be relevant:

Category	Identity of document and relevant passage		Relevant to claims
X, Y	GB 2291565 A	(MITEL) see abstract and especially page 4 line 17 to page 6 line 10, page 10 lines 1-14 and figures	X:1, 22 at least Y:7, 26 at least
Y	GB 2222503 A	(CALLSCAN) see abstract and whole document	7, 26 at least
Y	GB 2118804 A	(SAHKOLIIKKEIDEN) see abstract and whole document	7, 26 at least
X, Y	EP 1011278 A2	(SYMBOL) see abstract and whole document	X:1-5, 17, 22-25 at least Y:7, 26 at least
X	EP 0709983 A1	(IBM) see abstract and figures 1, 1a	22 at least
X, E	WO 01/33773 A1	(BROADCOM) see abstract and whole document	22 at least
X, E	WO 00/70895 A1	(SIEMENS) see abstract and figures	22
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Claims searched: 1-27 **Date of search:** 14 December 2001

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X	US 5424859	(UEHARA et al.) see abstract and whole document	22 at least
X	JP 100041969 A	(NIPPON) see JAPIO and EPODOC online abstracts and figure 1	1, 22
X	JP 080223172 A	(MITSUBISHI) see JAPIO and EPODOC online abstracts and figures, especially fig. 35	22 at least

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